Serum Selenium Level in Juvenile Rheumatoid Arthritis

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Abstract: The aim of this work was to study the level of serum selenium in juvenile rheumatoid arthritis and to study its correlation with different parameters of disease activity. Selenium exerts myriad effects on the immune system and functions through several different pathways: 1- Reduction of organic and inorganic peroxides, 2- metabolism of hydroperoxides which are inter-mediate steps in the metabolism of prostaglandins and leukotrienes derived from arachidonic acid and 3-modulation of the respiratory burst through the control of super oxide (02) and hydrogen peroxide generation. Atomic absorption spectrophotometric assay of serum selenium was performed in twenty juvenile rheumatoid arthritis patients and twelve healthy persons matched for or age and sex as a control group. Data analyses showed a significant decrease in selenium serum level in patients with (JRA) as compared to controls. There was a negative significant correlation with parameters of disease activity "morning stiffness, articular index and ESR". Decreased serum selenium level in JRA might affect selenium's ligand enzyme glutathione peroxidase activity leading to decrease in antioxidative capacity of the glutathione peroxidase / reductase system and this could have a pathogenic role in chronic inflammation of JRA. New York Science Journal 2011;4(6):11-14]. (ISSN: 1554-0200). http://www.sciencepub.net/newyork.

Keyword: Selenium; Rheumatoid arthritis; immune system**.**

1. Introduction

The role of trace elements in the pathogenesis of human disease is of topical interest (Ebadi *et al*., 1984 and Parasad *et al*., 2009)

The effect of selenium on the immune function is derived from the selenium-dependent enzymes glutathione peroxidase and phospholipide hydroperoxid. Glutathione peroxidase is responsible for antioxidant activities in reactions (Bendich, 1990**)** as follow:

$$H_2O_2 + 2GSH \text{ glutathione} \xrightarrow[\text{Peroxidase}]{\text{Se-glutathione}} 2H_2O + \text{GSSG oxidized glutathione}$$

$$\underset{\text{Lipid Hydroperoxide}}{LOOH} + 2GSH \xrightarrow[\text{Peroxidase}]{\text{Se-glutathione}} \underset{\text{Lipid aldehyde}}{LOH} + GSSG + H_20$$

Both enzymes participate in the reduction of prostaglandin G2 in the arachidonic acid cascade leading to the production of thromboxane A2, prostacyclin, and prostaglandin (Spallholz *et al*, 1990). They also participate in the production of leukotrienes and lipoxin through the reduction of the hydroperoxy intermediates (Ursini *et al*, 1985). Eicosanoild synthesis is significantly diminished in the absence of selenium (Bryant *et a*l, 1981).

It is likely that both the anti-inflamm- atory and immune modulating effects of selenium are mediated by means of the effect of its liganed enzymes on the production of eicosanoids and the reduction of hydroperoxides. Dietary supple-mentation of selenium is associated with increased production of super oxide in an animal model (Spallholz & Boylan 1989).

A low selenium status has been reported in both rheumatoid arthritis (RA) (Tarp et al, 1989) and juvenile rheumatoid arthritis (JRA) (Honkanen *et al*, 1989).

Selenium has been administered to patients with rheumatoid arthritis (RA) and osteoarthritis (OA) without apparent effect (Hill & Bird, 1990).

The Aim of the Work:

The aim of this work was to study the level of serum selenium in juvenile rheumatoid arthritis and to study its correlation with different parameters of disease activity.

2. Patients and Methods:

This study included 20 patients with Juvenile rheumatoid arthritis (JRA) diagn- osed according to American College of Rheumatology Criteria for children with chronic idiopathic artthritis of the peripheral joints (Cassidy et al, 1986). They were 14 females and 6 males with age ranged between4-13 years with a mean of 8.30±3.59 years and 12 healthy children matched for age and sex as a

control group, their age ranged between 3-14 years with a mean of 8.2 ± years. Both patients and control groups have not been supplemented before with selenium.

All patients were treated with metho- trexate alone or in combination with dagrinol (hyrdoxy choloroquine) non of them received corticosteroids in the last six months.

All the patients were subjected to a full history taking and a thorough clinical exami- nation to confirm the diagnosis of (JRA).

Assessment of the activity of Juvenile rheumatoid arthritis of (JRA) was carried out according to the following parameters.

1- Duration of morning stiffness in minutes

2- Articular index of joint tenderness according to Ritchie *et al*, 1968.

3- Erythrocyte sedimentation rate in first hour in mm/hr.

Atomic absorption spectrophotometric assay of serum selenium for both patients and control groups (3010 Perkin El-mer) (Willis, 1960).

Ethical Aspects:

Obtaining approval from the ethical committee of the organization of the Teaching Hospital and Institutes for this research. All patients will be informed about materials used in study method and period of the study. Obtaining a written consent from the patients. Patients suffering from any other medical problem discovered accidentally will be referred to a specialist of this problem

3. Results:-

Table 1: shows mean value± S.D. for age, disease duration, some parameters of disease activity, and the concentration of serum selenium in juvenile rheumatoid arthritis (JRA) patients.

Table 2: shows patients with Juvenile rheumatoid arthritis versus the control group.

Table 3: shows a significant decrease ($P < 0.05$) in the levels of serum selenium in JRA patients as compared to the control group.

Table 4: shows a negative significant correlation of serum selenium with parameters of disease activity in juvenile rheumatoid arthritis patients.

Table (1): Parameters of disease activity and serum selenium level in (JRA) patients (mean±SD).

Variables	Mean±SD
Age. (Years)	8.3± 3.59
Disease duration (years)	4.75± 1.94
Morning stiffness/min	65.2± 30.54
RAI	35 ± 11.8
ESR (mm/hr)	55 ± 18.86
Serum selenium (mg/dl)	0.54 ± 0.269

RAI = Ritchie articular index. ESR = Erythrocyte sedimentation rate

Table (2): Patients versus the control group

	Patients	Control
Total number	20	12
Sex: females	14	8
males	6	4
Age (years)	8.3 ± 3.59	8.2 ± 5.83

Table (3): Serum selenium in patients with juvenile rheumatoid arthritis (JRA) versus the control group.

Variables	Patients	Control	P
Serum selenium (mg/dl)	0.54 ± 0.269	1.05 ± 0.36	< 0.05

< 0.05 = significant

Table (4): Correlation coefficient of serum selenium with parameters of disease activity in juvenile rheumatoid arthritis (JRA) patients.

Parameters of diseasa activity	Serum Selenium	
Morning stiffness	0.51	< 0.05
RAI	0.58	0.05
ESR	0.54	0.05

P < 0.05 = significant RAI = Ritchie articular index. ESR = Erythrocyte sedimentation rate

4. Discussion:

Several reports suggested that the body electrolytes and level of some trace elements play vital role in many diseases (Sheth 1974, Lihan et al 1999 and sherifa et al 2004)

Our results showed that patients with Juvenile rheumatoid arthritis (JRA) have low selenium concentration in the serum compared with the control group.

The finding of low selenium concentration agrees with the previous results of Peretz, *et al*, (1991) and Trap *et al*, (1992) and may be interpreted as a response to arthritic activity (Trap, *et al*, 1989).

Selenium is an integral part of glutathione peroxidase and inter-acts with vitamin E in protecting cell membrane against oxidative damage by peroxides produced from lipid metabolism (Tappel, 19 74).

Selenium is not anti-oxidant until they are incorporated into anti-oxidant enzymes (Bendich, 1990).

Regarding the correlation between serum levels of selenium with the parameters of disease activity in (IRA) there was a significant negative correlation of serum selenium level with the duration of morning stiffness, articular index and ESR. This agrees with the results of Tarp, *et al*., (1985)., who found the same in adult (RA) patients with severe disease activity.

On the contrary, Honkanen *et al*, (1989) found that serum selenium did not correlate with the activity of the disease. Ostrov (1992) stated that the biochemical aberrations seen in Juvenile rheumatic diseases reflect altered utilization of nutrients in response to inflammation either due to these nutrient redistribution or deficiency.

Several studies have suggested a ligand enzyme glutathione peroxi dase activity leading to decrease in antioxidative capacity of the glutathione peroxidase /reductase system and this could have pathogenic role in chronic inflammation of (JRA) state of increased oxidative stress and reduced ability to resist attack by radicals in rheumatoid arthritis (Situnayake *et a*l, 1991). Several experimental studies have indicated that interference with glutathlone peroxidase/reductase system makes cell more susceptable to oxidative damage (Suttorp and simon, 1986 and Baker *et a*l, 1988)

In rheumatoid arthiritis, patients with severe disease, selenium supplementation is able to increase a low glutathione peroxidase activity in serum erythrocytes but not in the polymorph nuclear leucocytes (Tarp *et a*l, 1992). Probably as a result of the impaired uptake of selenium during the formation of cells in the bone marrow thus leucocytes seem insufficiently protected when exposed to radicals and damage of the polymorph nu-clear leucocytes may enhance tissue damage during inflammation (Salin and McCord, 1975, and Baker and Cohen, 1983).

The balance between extra-cellular free radical formation, re-lease and antioxidant enzyme protection may be important in the inflammation and tissue destruction of immune-mediated inflammatory disease (Kremer, 1993).

Conclusion

We could conclude that the decrease in the serum selenium level in JRA might affect the, selenium's ligand enzyme glutathione peroxidase activity leading to decrease in antioxidative capacity of the glutathione peroxidase / reductase system and this could have a pathogenic role in chronic inflammation of JRA

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